

<b>Course ID:</b>	<b>Course Title:</b>	<b>Winter 2021</b>
<b>BIO 310</b>	<b>Quantitative Methods for the Biological Sciences</b>	<b>Prerequisite: Math 30</b>
		<b>Credits: 3</b>

Class Information		Instructor Information		Important Dates	
<b>Days:</b>	Tue/Thurs	<b>Instructor:</b>	John Wiest	<b>First day of classes:</b>	January 11, 2021
<b>Time:</b>	8:15 – 9:30 AM	<b>Email:</b>	<a href="mailto:jwiest@ambrose.edu">jwiest@ambrose.edu</a>	<b>Last day to add/drop, or change to audit:</b>	January 24, 2021
<b>Room:</b>	Online	<b>Phone:</b>	(403) 410-6915	<b>Last day to request revised exam:</b>	March 8, 2021
<b>Tutorial:</b>	Mon: 8:00 -11:00 AM Online	<b>Office:</b>	L2115	<b>Last day to withdraw from course:</b>	March 19, 2021
<b>Final Exam:</b>	T.B.A.	<b>Office Hours:</b>	Wed: 10:00 – 11:00 AM Online	<b>Last day to apply for coursework extension:</b>	March 29, 2021
				<b>Last day of classes:</b>	April 16, 2021

### Course Description

This course is designed to give students a basic understanding of descriptive and inferential statistics. Emphasis is placed on practical application and students will learn to analyze and interpret basic statistical research. Topics include collection and presentation of data, descriptive statistics, introduction to probability theory, estimation, hypothesis testing, correlation and linear regression, and experiment design. Students will also learn how to use computer software to analyze data.

### Expected Learning Outcomes

- Demonstrate an understanding of what “statistics” is
- Analyze the advantages and drawbacks of different methods of viewing and describing data
- Choose the appropriate statistical technique based on a given situation
- Understand how probability, probability distributions, and hypothesis testing are used in statistics
- Interpret the results of statistical analyses, draw conclusions, and describe solutions

## Course Outline

### Part 1: Descriptive Statistics

- Data in all its forms
  - Key terminology, Definitions of Statistics
  - Levels of Measurement
  - Data, sampling, and variation
  - Frequency and Frequency Tables
- Graphical Techniques
  - Stem-and-Leaf Graphs, Line Graphs, Bar Graphs
  - Histograms, Frequency Polygons
  - Box Plots
- Numerical Methods
  - Describing Central Tendency
  - Measures of Variation
  - Percentiles, Quartiles, and Whiskers Displays

### Part 2: Probability & Probability Distributions

- The Concept of Probability
  - Sample Spaces and Events
  - Some Elementary Probability Rules
  - Conditional probability and Independence
- Discrete Random Variables
  - Two Types of Random Variables
  - Discrete Probability Distributions
  - Binomial Distributions
  - Poisson Distributions
- Continuous Probability Distributions
  - The Uniform Distribution
  - The Normal Probability Distribution
- Sampling & Sampling Distributions
  - Random Sampling
  - The Sampling Distribution of the Sample Mean
  - The Central Limit Theorem
  - The Sampling Distribution of the Sample Proportion
  - Surveys and Errors in Survey Sampling

### Part 3: Confidence Intervals & Hypothesis Testing

- Confidence Intervals
  - z-Based Confidence Intervals
  - t- Based Confidence Intervals
  - Sample Size Determination
  - Confidence Intervals for a Population Proportion
- Hypothesis Testing
  - The Null and Alternative Hypotheses
  - Errors in Hypothesis Testing
  - z-Test about a Population Mean
  - t- Test about a Population Mean
  - z-Test about a Population Proportion

#### Part 4: Statistical Inferences Methods

- Statistical Inferences Based on Two Samples
  - Comparing Two Population Means
  - Paired Difference Experiments
  - Comparing Two Population Proportions
  - The F-Distribution and One-way Independent ANOVA
- Chi-Square Tests
  - Chi-Square Distribution
  - Chi-Square Goodness-of-Fit Tests
  - A Chi-Square Test of Independence
- Correlation and Regression
  - Correlation Coefficients
  - Significance testing for a correlation coefficient
  - The Regression equation

#### Textbook and Software

*Introductory Statistics*, Illowsky & Dean, <https://openstax.org/details/introductory-statistics>

#### Additional Requirements

All students should have, at minimum, a calculator capable of performing statistical functions (i.e. able to input a data set and compute mean, standard deviation, etc.). You will also need a laptop on which you can download some open source software to be discussed later in this document

#### Course Requirements and Evaluation:

Course grading and evaluation will be conducted according to the following:

<b>Online Assignments</b>	25%
<b>On Paper Assignments</b>	20%
<b>Midterm Exam</b>	25%
<b>Final Exam</b>	30%

To pass the course, students must achieve an overall grade of at least 50%.

#### Submission of Assignments:

- Access to the online assignments will be through the Lyryx Learning webpage ([www.lyryx.com](http://www.lyryx.com)). Students will need to purchase access to these online assignments (it should be around \$40). Details on the specific course section and how to access this will be on the course moodle page. If you do not purchase this access, you will not be able to complete the Online Assignments. I'm planning for there to be 6 Online Assignments, but I will record your highest 5 marks.
- The two On Paper Assignments, the Midterm, and the Final, will all be posted to the course Moodle page. The Midterm and Final will only be posted on the specific days they happen, whereas the On Paper Assignments will have a bit more lead time.
- The two On Paper Assignments will invite you to engage with an open source statistical software/programming language known as R. You will need to download a version of R to your computers to do some of this work. Instructions on how to download this software will be on the moodle page. These assignments will require you to create some R code which will be run to answer certain statistical problems. Your submission for these assignments will primarily be your R code, instructions about which will be given in greater detail on the assignments themselves.

- The Midterm Exam and Final Exam will require you to write work on paper. You will need to answer short answer questions, and show your computational work, (i.e. fill out formulas correctly and not just give answers). Submission of this work will be via email. That said, there are two methods for submitting this work that will be accepted:
  - 1) You can scan your written work into a PDF and then upload that PDF. This PDF will need to have the questions in the correct order and be generally legible.
  - 2) You can take CLEAR images of your written work (jpegs, etc.), and then put those images into a single Word document in the correct order, oriented properly, and then email me that Word document.
  - Please note, I will only consider one of these two methods. I will not allow hyperlinks to your google docs, I won't look at a bunch of individually sent, sideways jpegs that I have to waste my time rotating and resizing to make them readable, and I won't un-shuffle your work because you decided it would be a treat for me to have to read your questions in random order. I want to have ONE document that I can scroll through from top to bottom like a sane person.

### **Class Participation and Attendance:**

Honestly, we're in uncertain times, and I recognize that some of you may have difficulty attending due to illness or other mitigating factors. I will not be taking attendance, but I do recommend attending for your success. I will do my best to make sure that online resources are posted online in a timely and reasonable fashion so that those of you who miss classes will have a chance to catch up, but the onus will be on you to catch up on any missed materials. As for participation, your learning should be an ACTIVE process; I can't just dump information into your head. Those who participate, even online, tend to do better than those who sit and stare in silence, and definitely do better than those who don't show up. **ALSO**, if you miss a major deadline or a test due to absenteeism, and you don't make any effort to contact me about that, then your grades will certainly suffer. I am happy to work with you guys in these unprecedented times, but please don't try to take advantage of the situation. Unexcused missed assignments or tests will be left as zeroes.

### **Grade Summary:**

The available letters for course grades are as follows:

<i>% Grade</i>	<i>Letter Grade</i>	<i>Description</i>
95% to 100%	A+	
90% to 94%	A	Excellent
85% to 89%	A-	
80% to 84%	B+	
76% to 79%	B	Good
72% to 75%	B-	
68% to 71%	C+	
64% to 67%	C	Satisfactory
60% to 63%	C-	
55% to 59%	D+	
50% to 54%	D	Minimal Pass
0% to 49%	F	Failure

Because of the nature of the Alpha 4.00 system, there can be no uniform College-wide conversion scale. The relationship between raw scores (e.g. percentages) and the resultant letter grade will depend on the nature of the course and the instructor's assessment of the level of each class, compared to similar classes taught previously.

Please note that final grades will be available on student registration system. Printed grade sheets are not mailed out.

### **Other Important Dates:**

Jan 28: Program Day (no daytime classes)  
Feb 04: Day of Prayer  
Feb 15 – 20: Family Day/Reading Week (no classes)  
**Feb 23: Midterm Exam**  
Mar 12-14: Legacy Youth Conference  
Apr 2: Good Friday (No classes)  
Apr 5: Easter Monday (No classes)  
Apr 19-26: Finals Week

**The final exam date will be discussed in class before the end of January.**

## Ambrose University Academic Policies:

### Communication

All students have received an Ambrose e-mail account upon registration. It is the student's responsibility to check this account regularly as the Ambrose email system will be the professor's instrument for notifying students of important matters (cancelled class sessions, extensions, requested appointments, etc.) between class sessions. If students do not wish to use their Ambrose accounts, they will need to forward all messages from the Ambrose account to another personal account.

### Registration

During the **Registration Revision Period** students may enter a course without permission, change the designation of any class from credit to audit and /or voluntary withdraw from a course without financial or academic penalty or record. Courses should be added or dropped on the student portal by the deadline date; please consult the List of Important Dates. After that date, the original status remains and the student is responsible for related fees.

Students intending to withdraw from a course after the Registration Revision Period must apply to the Office of the Registrar by submitting a "Request to Withdraw from a Course" form or by sending an email to the Registrar's Office by the **Withdrawal Deadline**; please consult the List of Important Dates on the my.ambrose.edu website. Students will not receive a tuition refund for courses from which they withdraw after the Registration Revision period. A grade of "W" will appear on their transcript.

Students wishing to withdraw from a course, but who fail to do so by the applicable date, will receive the grade earned in accordance with the course syllabus. A student obliged to withdraw from a course after the Withdrawal Deadline because of health or other reasons may apply to the Registrar for special consideration.

### Exam Scheduling

Students, who find a conflict in their exam schedule must submit a Revised Examination Request form to the Registrar's Office by the deadline date; please consult the List of Important Dates. Requests will be considered for the following reasons only: 1) the scheduled final examination slot conflicts with another exam; 2) the student has three final exams within three consecutive exam time blocks; 3) the scheduled final exam slot conflicts with an exam at another institution; 4) extenuating circumstances. Travel is not considered a valid excuse for re-scheduling or missing a final exam.

### Electronic Etiquette

Students are expected to treat their instructor, guest speakers, and fellow students with respect. It is disruptive to the learning goals of a course or seminar and disrespectful to fellow students and the instructor to use electronics for purposes unrelated to the course during a class session. Turn off all cell phones and other electronic devices during class. Laptops should be used for class-related purposes only. Do not use iPods, MP3 players, or headphones. Do not text, read, or send personal emails, go on Facebook or other social networks, search the internet, or play computer games during class. Some professors will not allow the use of any electronic devices in

class. The professor has the right to disallow students to use a laptop in future lectures and/or to ask students to withdraw from the session if they do not comply with this policy. Repeat offenders will be directed to the Dean. If you are expecting communication due to an emergency, please speak with the professor before the class begins.

### Academic Policies

It is the responsibility of all students to become familiar with and adhere to academic policies as stated in the Academic Calendar. Personal information (information about an individual that may be used to identify that individual) may be required as part of taking this class. Any information collected will only be used and disclosed for the purpose for which the collection was intended. For further information contact the Privacy Compliance Officer at [privacy@ambrose.edu](mailto:privacy@ambrose.edu).

### Extensions

Although extensions to coursework in the semester are at the discretion of the instructor, students may not turn in coursework for evaluation after the last day of the scheduled final examination period unless they have received permission for a course Extension from the Registrar's Office. Requests for course extensions or alternative examination time must be submitted to the Registrar's Office by the deadline date; please consult the List of Important Dates. Course extensions are only granted for serious issues that arise "due to circumstances beyond the student's control."

### Appeal of Grade

An appeal for change of grade on any course work must be made to the course instructor within one week of receiving notification of the grade. An appeal for change of final grade must be submitted to the Registrar's Office in writing and providing the basis for appeal within 30 days of receiving notification of the final grade, providing the basis for appeal. A review fee of \$50.00 must accompany the appeal. If the appeal is sustained, the fee will be refunded.

### Academic Integrity

We are committed to fostering personal integrity and will not overlook breaches of integrity such as plagiarism and cheating. Academic dishonesty is taken seriously at Ambrose University as it undermines our academic standards and affects the integrity of each member of our learning community. Any attempt to obtain credit for academic work through fraudulent, deceptive, or dishonest means is academic dishonesty. Plagiarism involves presenting someone else's ideas, words, or work as one's own. Plagiarism is fraud and theft, but plagiarism can also occur by accident when a student fails or forgets to acknowledge to another person's ideas or words. Plagiarism and cheating can result in a failing grade for an assignment, for the course, or immediate dismissal from the university college. Students are expected to be familiar with the policies in the current Academic Calendar that deal with plagiarism, cheating, and the penalties and procedures for dealing with these matters. All cases of academic dishonesty are reported to the Academic Dean and become part of the student's permanent record.

**Note:** Students are advised to retain this syllabus for their records.